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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 10/777,763 | 02/13/2004 | Anthony J. Magrath | M0025.0305/P305 | 5334 |

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DICKSTEIN SHAPIRO MORIN & OSHINSKY LLP
2101 L Street, NW
Washington, DC 20037

| EXAMINER | |
|---|---|
| WAMSLEY, PATRICK G | |

| ART UNIT | PAPER NUMBER |
|---|---|
| 2819 | |

DATE MAILED: 05/12/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/777,763 | MAGRATH, ANTHONY J. | |
| | Examiner | Art Unit | |
| | Patrick G. Wamsley | 2819 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-31* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-3,5-7,9,10,17-20,22,23 and 29-31* is/are rejected.

7)☒ Claim(s) *4,8,11-16,21 and 24-28* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *13 February 2004* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *02/04, 08/04*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

## DETAILED ACTION

### *Drawings*

Figures 1, 2, 3, and 4 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g).

The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the shifters must be shown or canceled from claim 7. No new matter should be entered.

The drawings are objected to because of the following informalities:

Figure 2, Block 6: Change "Lineariser" to -- Linearizer --.

Figure 2, Block 7: Change "Quantising" to -- Quantizing --.

Corrected drawings in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the examiner does not accept the changes, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

### *Specification*

The disclosure is objected to because of the following informalities:

Page 2, ¶1, line 9: Change "analogue" to -- analog --.

Page 2, ¶2, line 3: Change "lineariser" to -- linearizer --.

Page 3, ¶3, line 4: Change "figure 3" to -- Figure 3 --.

Page 4, ¶3, line 4: Change "centre-point" to -- center-point --.

Page 5, ¶3, line 2: Change "cascade-of-integrator" to -- cascaded integrator --.

Page 6, ¶1, line 1: Change "whilst" to -- while --.

Page 7, ¶5, line 2: Change "Converter" to -- converter --.

Appropriate correction is required.

The specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

***Claim Objections***

Claims 1, 4, 6, 8-11, 18, 23-24, 27,and 31 are objected to because of the following informalities:

Claim 1, line 4: Change "quantiser" to -- quantizer --.

Claim 1, line 7: Change "quantiser" to -- quantizer --.

Claim 4, line 1: Change "first feedback" to -- outer feedback --.

Claim 6, line 2: Change "second feed-back" to -- inner feedback --.

Claim 8, line 2: Change "normalise" to -- normalize --.

Claim 9, line 6: Change "quantising" to -- quantizing --.

Claim 10, line 1: Change "Lineariser" to -- Linearizer --.

Claim 10, line 3: Change "linearised" to -- linearized --.

Claim 11, line 1: Change "Lineariser" to -- Linearizer --.

Claim 11, line 9: Change "linearised" to -- linearized --.

Claim 18, line 1: Change "quantising" to -- quantizing --.

Claim 18, line 4: Change "quantising" to -- quantizing --.

Claim 18, line 7: Change "quantiser" to -- quantizer --.

Claim 23, line 1: Change "linearising" to -- linearizing --.

Claim 24, line 1: Change "Linearising" to -- linearizing --.

Claim 24, line 7: Change "linearised" to -- linearized --.

Claim 27, line 2: Change "merged" to -- are merged --.

Claim 31, line 2: Change "quantiser" to -- quantizer --.

Appropriate correction is required.

### *Claim Rejections - 35 USC § 112*

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claim 7 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. On Page 13, ¶4, lines 1-3, the specification indicates that shifters are used instead of multipliers in a "cascade of integrators" structure but does not explain how they are used to implement loop filter coefficients. While it is allegedly "easy" to implement this architecture [Page 14, ¶2, lines 8-9 and Page 14, ¶3, lines 3-4], the disclosure never describes how this implementation is actually achieved. Moreover, the shifters do not appear in any drawings. As a result, the examiner is unable to properly assess the metes and bounds of claim 7 without further explanation.

### *Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 18, 19, 20, 22, 23, 29, 30 and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over the Admitted Prior Art, hereafter APA, in view of U.S. Patent 4,467,291 to Roza, hereafter Roza.

APA discloses a word length reduction circuit, hereafter WLR [Page 5, line 1], for quantizing a multibit input signal into a multibit output signal, comprising an input for receiving input signals and a quantizer [both functions are performed by element 7]. APA's noise shaper circuit [Page 4, last two lines] is used in digital audio amplifiers [Page 1, ¶2, first two lines]

Unlike claims 18 and 31, APA lacks a feedback loop. In contrast, Roza discloses a delta modulator comprising a loop filter [7] in a feedback loop. The noise transfer function of this feedback loop filter should be functionally equivalent to the equation recited in claim 31. At the time of the invention, it would have been obvious to one of ordinary skill in the art to have applied Roza's feedback loop teachings to APA's WLR circuit. The motivation would have been to improve the signal to quantization noise ratio, as suggested by Roza [col. 1, line 24].

For claim 19, APA discloses a cascaded integrator structure [Page 5, ¶3, line 2]. Moreover, Roza's loop filter is in the form of a single or a double integrator [col. 1, lines 17-18].

For claim 20, APA discloses sigma-delta modulation [Page 5, ¶3, line 1].

For claim 22, APA converts PCM signals into PWM signals [Page 1, ¶1, lines 9-11].

For claim 23, APA discloses a linearizer [6].

For claim 29, APA discloses a digital amplifier [Page 1, ¶1, line 1].

For claim 30, APA discloses a carrier medium [Page 1, ¶1, lines 6-8].

Claims 1, 2, 3, 5, 6, 9,10, and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over the APA / Roza combination, further in view of U.S. Patent 4,654,711 to Fujimori, hereafter Fujimori.

Unlike claim 1, APA and Roza lack a combination of inner and outer feedback loops. In contrast, Fujimori discloses the addition of a local feedback loop to a global feedback loop in a delta sigma converter [col. 7, lines 63-67]. At the time of the invention, it would have been obvious to one of ordinary skill in the art to have applied Fujimori's feedback loop teachings to the APA / Roza combination. The motivation would have been to maintain a high signal to noise ratio [col. 5, line 54].

For claim 2, APA discloses a cascaded integrator structure [Page 5, ¶3, line 2]. Moreover, Roza's loop filter is in the form of a single or a double integrator [col. 1, lines 17-18].

For claim 3, APA discloses sigma-delta modulation [Page 5, ¶3, line 1].

For claim 5, Roza uses an adder [2] to couple a feedback loop including a loop filter [7] to the input signal [1].

For claim 6, applying Fujimori's teachings to the APA / Roza combination, a second adder would be needed due to the use of local and global feedback loops.

For claim 9, APA converts PCM signals into PWM signals [Page 1, ¶1, lines 9-11].

For claim 10, APA discloses a linearizer [6].

For claim 17, APA provides a WLR circuit.

***Allowable Subject Matter***

Claim 4, 8, 11-16, 21, and 24-28 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: the references of record neither reveal nor render obvious the recited combination including the use of least significant bits [LSBs] in a feedback loop [claims 4 and 21], the use of limiters to modify scaling factors [claim 8]; the use of estimation algorithms [claims 11-16 and 24-28]

***Conclusion***

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. U.S. Patent 6,822,594 to Melanson discloses delta sigma modulators with feedback loop filters [206]. U.S. Patent 6,741,123 to Andersen et al describes a delta sigma modulator having a loop filter [202], quantizer [204] and feedback loop [205]. U.S. Patent 6,738,004 to Melanson shows a delta sigma modulator having a loop filter [104], quantizer [106] and feedback loop. U.S. Patent 6,724,332 to Melanson discloses a noise shaper having two loop filters [206 / 208], a quantizer [203], and two feedback loops. U.S. Patent 6,567,025 to Schreier et al shows a multi-bit sigma-delta ADC having a quantizer [200], a loop filter [51 / 53], and a variable DAC feedback loop. U.S. Patent 6,404,369 to Sheen discloses a loop filter [212], quantizer [214], and feedback DAC model [222]. U.S. Patent 6,184,812 to

Younis et al provides a delta-sigma ADC having a loop filter [57] in a feedback loop. U.S. Patent 5,959,562 to Wiesbauer shows a sigma delta modulator having a quantization noise nulling signal. U.S. Patent 5,461,422 to Hsieh presents a quantizer using a loop filter [42] in a feedback loop. U.S. Patent 5,230,012 to Schenk uses a loop filter [SF} in a feedback loop with an analog to digital converter. U.S. Patent 4,692,737 to Stikvoort et al shows an encoding device having a loop filter [28] in a feedback loop.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Patrick G. Wamsley whose telephone number is (571) 272-1814. The official facsimile number is (703) 872-9306. An alternate facsimile number, (571) 273-1814, should only be used for unofficial documents.

Patrick G. Wamsley
May 6, 2005